DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-7 and 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reinhardt ('902) in view of Lakes (4,668,557) and Furukawa et al. (WO03/058698A1; US publication 2005/0107007 referenced as English translation).

3. In reference to claim 1, Reinhardt discloses a polishing pad made of polyester and polyether polyurethanes and further discloses that the pads may be formed by foaming (col. 2, lines 43-48), thus forming the polishing pad out of a polyester and polyether polyurethane foam that is inherently porous (based on the definition of foam of "Any of various light, **porous**, semirigid or spongy materials[1]"). However, Reinhardt fails to disclose that the porous polymeric material has a Poisson's ration less than zero. Lakes discloses a method of making polymeric foams that have negative Poisson's ratios and teaches that the negative Poisson's ration polymeric foams can replace polymeric foams having positive Poisson's ratios in many applications to provide improved properties. Lakes further disclose that polymeric foams having negative Poisson's ratios are more advantageous than conventional foam materials in

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[1] *The American Heritage® Dictionary of the English Language, Fourth Edition*

applications where superior strength and abrasion resistance are desired along with a compliant foam (col. 4, line 64-col. 5, line 3). It is well known in the art that superior strength and abrasion resistance are desired properties for polishing pads and Furukawa specifically discloses that high abrasion resistance is a requirement for long life of polishing pads (paragraph 8) and further teaches that polishing pads made of foamed polyurethane (such as the pads disclosed by Reinhardt) generally fail to have the desired abrasion resistance to provide long life of the polishing pad. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the conventional polyurethane foam of the Reinhardt polishing pad with polyurethane foam having a Poisson's ration below zero, to improve strength and abrasion resistance, which are well known in the art as desired properties of polishing pads and will increase the life of the polishing pad, as taught by Furukawa.

4. In reference to claims 2 and 3, it further would have been obvious to one of ordinary skill in the art to produce the polyether polyurethane foam having a negative Poisson's ratio using the method disclosed by Lakes and Lakes further provides a specific example of a polyester foam that was produced using the disclosed method that has a Poisson's ration of -0.7 (col. 3, lines 38-62). Although Lakes does not disclose a specific example of a polyether polyurethane foam, it would be obvious that the polyether polyurethane foam of Reinhardt will have very similar properties to a polyester foam and once treated using the method of Lakes would have a Poisson's ratio similar to that of the treated polyester foam example of Lakes. Thus, it would have been obvious that the polyether polyurethane foam, having a Poisson's ratio of less than

zero, would have a Poisson's ratio of about -0.7, which falls within the claimed range of about -0.8 to about -0.2.

5. In reference to claim 4, polyester, polyether and polyurethane are all materials that are well known as thermoplastic and/or thermoset polymers.

6. In reference to calms 5 and 6, Reinhardt discloses that the polishing pad is made of polyester and polyether polyurethanes, as discussed supra.

7. In reference to claim 7, Reinhardt discloses that the polymeric product will preferably have a density of greater than 0.5 g/cm^3 (col. 2, lines 60-64), which provides a range that overlaps the claimed range of 1 g/cm^3 or less, and thus provides a proper rejection of the claimed range (See MPEP §2131.03).

8. In reference to claims 16 and 17, Reinhardt further discloses that the polishing pad may comprise abrasive particles of alumina, silica, titania or ceria (col. 2, lines 49-59).

9. In reference to claims 18-20, it would be obvious to one of ordinary skill in the art at the time the invention was made to polish a work piece through the method of: providing a work piece to be polished, contacting the work piece with a chemical-mechanical polishing system comprising the polishing pad discussed supra and abrading at least a portion of the surface of the work piece with the polishing system to polish the work piece.

10. Claims 8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reinhardt ('902) in view of Lakes (4,668,557) and Furukawa et al. (WO03/058698A1;

US publication 2005/0107007 referenced as English translation) and further in view of Sevilla et al ('532).

11. Reinhardt in view of Lakes and Furukawa provides a polishing pad as discussed supra but fails to disclose that the pad has a void volume of about 75% or less or that the average pore diameter in the pad is between 0.1 and 2500 μm. Sevilla discloses a polishing pad made of a porous substrate and teaches that an average pore diameter from about 5 to 100 μm (microns) will enhance pad polishing performance (abstract, lines 5-7) and that a porosity or pore volume (void volume) between about 15% and 70%, preferably between 25% and 50%, has been found to yield acceptable polishing pads possessing the necessary flexibility and durability in use (col. 5, lines 28-34). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made that the pad of Reinhardt, made of polyester and polyether polyurethane foam should possess pores with an average diameter between 5 and 100 μm to enhance pad polishing performance and a porosity between 15% and 70% to provide the polishing pad with the necessary flexibility and durability for use.

12. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Reinhardt ('902) in view of Lakes (4,668,557) and Furukawa et al. (WO03/058698A1; US publication 2005/0107007 referenced as English translation) and further in view of Suzuki et al ('353).

13. Reinhardt in view of Lakes and Furukawa provides a polishing pad as discussed supra but fails to disclose that the pores in the pad should have a pore density greater than about 10 pores/cm. Suzuki discloses a polishing method including a polishing pad

and teaches that the surface roughness of the work piece is dramatically improved when finish polishing is conducted using a finish polishing pad with a pore density equal to or higher than a value (col. 3, 8-11) and further discloses a polishing pad with a pore density equal to or higher than 150 pores/cm^2 (approximately 12.2 pores/cm). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made that the pad of Reinhardt, made of polyester and polyether polyurethane foam, should have a pore density greater than or equal to 150 pores/cm^2 in order to dramatically improve the finish of a work piece through polishing.

14. Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reinhardt ('902) in view of Lakes (4,668,557) and Furukawa et al. (WO03/058698A1; US publication 2005/0107007 referenced as English translation) and further in view of Osterheld et al ('596).

15. Reinhardt in view of Lakes and Furukawa provides a polishing pad as discussed supra but fails to disclose that the surface of the polishing pad should comprise of linear grooves in the form of an XY crosshatch. Osterheld discloses a method and apparatus for chemical mechanical polishing using a patterned pad and teaches that a plurality of slurry distribution/retaining grooves are distributed with a first portion extending linearly over the surface of the pad along the x-axis and a second portion extends linearly over the surface of the pad along the y-axis defining an X-Y grid pattern (col. 5, lines 7-14) and that the grooves are adapted to inhibit slurry or other fluids from flowing off the pad during operation. Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made that the pad of Reinhardt, made of polyester and polyether

polyurethane foam should have linear grooves in the form of an XY crosshatch in order to distribute a slurry while preventing the slurry from flowing off the pad during operation.

16. Claims 14, 15 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reinhardt ('902) in view of Lakes (4,668,557) and Furukawa et al. (WO03/058698A1; US publication 2005/0107007 referenced as English translation) and further in view of Tang ('927).

17. Reinhardt in view of Lakes and Furukawa provides a polishing pad as discussed supra but fails to disclose an optically transmissive region that has a light transmission of at least 10% at one or more wavelengths between 190nm and 3500nm. Tang discloses an *in-situ* monitoring technique for end point detection during chemical mechanical polishing planarization including a polishing pad with an optically transmissive region. Tang teaches that the light source is capable of illuminating in the range of about 200 to 11,000 nm in wavelength and that when the wavelength is measured from the back side of the substrate (opposite light source) the wavelength is preferred to be 1,300 nm (col. 5, lines 6-12) which would be at least 11.8% of the light source being transmitted through the substrate. Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to provide the pad of Reinhardt, made of polyester and polyether polyurethane foam, with an optically transmissive region that has a light transmission of at least 11.8% at one or more wavelengths between 200nm and 11,000nm to monitor the end point during chemical mechanical polishing. It would also be obvious to polish a work piece by provide a work

piece to be polished, contacting the work piece with a chemical mechanical polishing system comprising the pad of Reinhardt, made of polyester and polyether polyurethane foam with an optically transmissive region and abrading at least a portion of the surface of the work piece with this polishing system.

Response to Arguments

18. Applicant's arguments filed 6/22/2011, in response to the decision by the Board of Patent Appeals and Interferences, have been fully considered but they are not persuasive. The applicant argues that in view of the evidence provided in the affidavit filed 6/22/2011, the combination of the Reinhardt, Lakes and Furukawa references (as well as the additional references applied to the rejections above) fail to make obvious the applicant's claimed invention. However, as discussed in the decision by the Board of Patent Appeals and Interferences, mailed on 1/26/2011, the disclosure of Reinhardt in view of the teachings of Lakes and Furukawa *do* make obvious the polishing pad having a negative Poisson's ratio as claimed. The applicant's additional arguments that the method of making a polishing pad having a negative Poisson's ratio is different than known methods for producing polishing pads is also not persuasive. Although known processes do not include steps necessary to provide a negative Poisson's ratio, the Lakes reference very clearly sets forth methods necessary to create polymeric materials having a negative Poisson's ration, which would obviously be applied to the known methods for producing polymeric polishing pads.

Conclusion

19. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Srinharan et al (6,743,388) and Alderson et al (6,878,320) both disclose additional advantages that are provided to polymer materials when they are treated to have negative Poisson's ratios.

20. All claims are drawn to the same invention claimed in the application prior to the entry of the submission under 37 CFR 1.114 and could have been finally rejected on the grounds and art of record in the next Office action if they had been entered in the application prior to entry under 37 CFR 1.114. Accordingly, **THIS ACTION IS MADE FINAL** even though it is a first action after the filing of a request for continued examination and the submission under 37 CFR 1.114. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRYAN R. MULLER whose telephone number is (571)272-4489. The examiner can normally be reached on Monday thru Friday 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Monica S. Carter can be reached on (571) 272-4475. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Bryan R Muller/
Primary Examiner, Art Unit 3727
8/31/2011